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PRC-BRAZIL COLLABORATION IN RENEWABLE WIND ENERGY: A CASE STUDY OF INTERDEPENDENCIES THROUGH THE LENS OF LIBERAL INTERDEPENDENCE THEORY

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Abstract

This paper examines the strategic collaboration between the People's Republic of China (PRC) and Brazil in the renewable wind energy sector. PRC's strategic engagement with Brazil in renewable wind energy has significantly impacted global energy markets, enabling the PRC to expand its investment, technological exports, and geopolitical influence in wider Latin America (LA). This study addresses the concerns surrounding the PRC's growing role in Brazil's wind energy sector- including investments and control over renewable energy production. Guided by the theoretical framework of Liberal and Economic Interdependence, this paper aims to answer the research question of how the PRC's renewable wind energy strategy in Brazil contributes to creating strategic dependencies and potential vulnerabilities associated with reliance on Chinese capital. Employing a qualitative methodology combining official document analysis, political discourse analysis, and expert interviews, this paper examines PRC's official strategies, energy diplomacy, and security implications, as well as the political and economic motivations driving its investments, technological exchanges, and joint ventures. The study evaluates the prospects of mutual interdependence between PRC and Brazil and offers insights from international renewable wind energy experts on the geopolitical implications of PRC's involvement in the global wind energy sector. Concluding that PRC's strategic engagement drives collaboration and growth in Brazil's wind energy sector, creating mutual interdependencies. However, these interdependencies are asymmetrical, resulting in greater

dependencies for Brazil compared to the PRC. Despite this imbalance, the cooperation also fosters some dependencies for the PRC, albeit to a lesser extent. The study contributes to the understanding of Sino-Brazilian energy relations and offers insights into the geopolitical implications of PRC's involvement in emerging renewable energy markets.

Keywords

Brazil, Economic Interdependence, PRC, PRC-Brazil Collaboration, Renewable Wind Energy.

Resumo

Este artigo examina a colaboração estratégica entre a República Popular da China (RPC) e o Brasil no setor das energias eólicas renováveis. O envolvimento estratégico da RPC com o Brasil na energia eólica renovável teve um impacto significativo nos mercados globais de energia, permitindo à RPC expandir o seu investimento, as exportações tecnológicas e a influência geopolítica na América Latina (AL) mais ampla. Este estudo aborda as preocupações em torno do papel crescente da RPC no setor da energia eólica do Brasil - incluindo investimentos e controlo sobre a produção de energia renovável. Guiado pelo quadro teórico da Interdependência Liberal e Económica, este artigo pretende responder à questão de investigação de como a estratégia de energia eólica renovável da RPC no Brasil contribui para a criação de dependências estratégicas e potenciais vulnerabilidades associadas à dependência do capital chinês. Empregando uma metodologia qualitativa que combina a análise de documentos oficiais, a análise do discurso político e as entrevistas com especialistas, este artigo examina as estratégias oficiais, a diplomacia energética e as implicações de segurança da RPC, bem como as motivações políticas e económicas que impulsionam os seus investimentos, intercâmbios tecnológicos e joint ventures. O estudo avalia as perspetivas de interdependência mútua entre a RPC e o Brasil e oferece insights de especialistas internacionais em energia eólica renovável sobre as implicações geopolíticas do envolvimento da RPC no setor global da energia eólica. Concluindo que o envolvimento estratégico da RPC impulsiona a colaboração e o crescimento no setor da energia eólica do Brasil, criando interdependências mútuas. No entanto, estas interdependências são assimétricas, resultando em maiores dependências para o Brasil em comparação com a RPC. Apesar deste desequilíbrio, a cooperação também promove algumas dependências para a RPC, embora em menor grau. O estudo contribui para a compreensão das relações energéticas sino-brasileiras e oferece insights sobre as implicações geopolíticas do envolvimento da RPC nos mercados emergentes de energias renováveis.

Palavras-chave

Brasil, Interdependência Económica, RPC, Colaboração RPC-Brasil, Energia Eólica Renovável.

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BEYOND IRON ORE: REFRAMING THE BRAZIL-CHINA PARTNERSHIP AS A MULTIFACETED ENGAGEMENT

LORHAN DE OLIVEIRA PEREIRA

KAI YIN ALLISON HAGA

1. Introduction

The 21st century has seen profound changes in the global energy sector due to the impacts of climate change caused by extensive fossil fuel use. Transitioning to green energy is essential for sustainable socioeconomic development, and mitigating climate change effects. In recent years, PRC and Brazil have increased their bilateral cooperation in renewable energy production, which has come with an increase in Chinese investments and technological exchange. PRC companies produce around 90% of solar and wind technologies in LA. PRC's increased control over Brazil's renewable energy production and distribution has raised international concerns (Myslikova & Dolton-Thornton, 2023). While the PRC's growing presence in Brazil strengthens its economy, it also affects Brazil's politics and security. Although this partnership offers sustainable alternatives to fossil fuels, concerns persist over the PRC's geopolitical strategy, which may lead to dependence on PRC capital and control over Brazil's critical infrastructure. Therefore, analyzing the PRC-Brazil collaboration in wind energy provides a valuable case study on the opportunities and risks involved. This paper analyzes the PRC's strategy and investments in renewable wind energy in Brazil, examining the implications for interdependence between the PRC and Brazil through the lens of *Liberal* and *Economic Interdependence Theories*.

The *central argument* is that while cooperation in renewable wind energy can provide benefits like technology transfer and increased investments, the PRC's strategy in Brazil can create asymmetric dependencies on Chinese capital, potentially limiting Brazil's autonomy.

To address the research question, of *how the PRC's renewable wind energy strategy in Brazil contributes to creating strategic dependencies and potential vulnerabilities associated with reliance on Chinese capital*- this study employs a qualitative methodology encompassing several key components. Firstly, an extensive *document analysis* was conducted, scrutinizing official publications and strategic documents from both the PRC and Brazil. This analysis utilized sources in multiple languages, including Chinese,

English, Latvian, Portuguese, and Spanish, to ensure a comprehensive and nuanced understanding of the subject matter. Secondly, a *political discourse analysis* was implemented to elucidate the political and economic motivations underlying the PRC's renewable energy investments and strategies. This involved a meticulous examination of speeches, policy documents, and official statements, providing insight into the strategic rationale behind the collaboration. Furthermore, the study incorporated expert *interviews* with international renewable wind energy specialists, garnering diverse perspectives on the geopolitical implications of the PRC's involvement in Brazil's wind energy sector. This multifaceted approach was chosen to facilitate a comprehensive evaluation of the strategic dependencies and potential vulnerabilities associated with the PRC-Brazil collaboration in the renewable wind energy sector.

The research presented in this article encompasses a time frame, spanning from the early 2000s to 2023, to analyze the collaborative efforts between the PRC and Brazil in the renewable wind energy sector. This timeframe is strategically chosen to capture the full arc of this partnership, beginning with PRC's initial forays into global economic expansion and culminating in the most recent developments as of early 2023. By examining over two decades of engagement, the study provides a longitudinal perspective that allows the identification of significant trends, policy impacts, and investment patterns. This period of analysis enables a nuanced understanding of how geopolitical initiatives, such as the PRC's *"Going Out"* Policy (走出去战略),[1] and the *Belt and Road Initiative* (一带一路) (BRI), have shaped the trajectory of Sino-Brazilian cooperation in wind energy, by offering insights into both historical and contemporary contexts.

To answer the research question, this article will systematically analyze several key topics and follow a structured approach. The *Introduction* sets the contextual background, introduces the PRC-Brazil collaboration in the energy sector, and presents the central research question and objectives. The *Literature Review* introduces the theoretical frameworks of Liberal Interdependence Theory and Economic Interdependence and examines the historical and geopolitical context of PRC-Brazil relations, alongside existing literature on their renewable energy collaboration and perspectives from both PRC and Brazilian scholars. The section on *Official PRC Strategies* offers a detailed analysis of PRC's strategies in the renewable wind energy sector, including historical policies and initiatives like the *"Going Out"* Policy and BRI. The PRC's *Energy Diplomacy and Security Implications* section explores PRC's energy security concerns and the role of its energy diplomacy and resource security. *PRC Investments* section analyzes the investments made by PRC in Brazil's renewable wind energy sector and the impact of Chinese companies and financial flows. The *Prospects for Mutual Interdependence* section examines the mutual dependencies created by PRC-Brazil cooperation, discussing potential risks and benefits for both countries. Insights from *International Renewable Wind Energy Experts* provide a summary of expert interviews on PRC's involvement in global wind energy and diverse perspectives on the topic of mutual interdependence. Finally, the *Conclusions* answer the research question, summarize the findings, assess

[1] Also known as the *"Going Global Strategy".*

the asymmetric interdependencies between PRC and Brazil, and offer policy recommendations for Brazil.

2. Literature Review

The *liberal interdependence theory* in IR suggests that actions by one entity significantly impact the outcomes and values of others (Coate, Griffin, & Elliott-Gower, 2017). There are two key dimensions of interdependence: *sensitivity* and *vulnerability*. *Sensitivity* measures the response to external influences before policy changes, while *vulnerability* reflects the costs imposed even after policy adjustments (Keohane & Nye, 2001).

Whereas *economic interdependence* refers to a state where parties- individuals, groups, companies, or nations- engage in transactions to satisfy their mutual needs through trade. This implies that all parties are interwoven in a network of economic dependencies, which drives international trade and cooperation. While mutual dependency may foster trade and profit opportunities it also poses potential risks like inequality and exploitation by dominant parties. Excessive reliance on a few external suppliers can lead to vulnerabilities in supply chains, which, in the event of disasters like economic downturns or natural calamities, could halt business operations and lead to economic downturns. Thus, evaluating supply chain stability and considering risk factors is crucial for minimizing negative business impacts and establishing fair, transparent, and sustainable economic relations (Tomasetti, 2024). Risks associated with economic interdependence include supply chain disruptions and increased costs. Excessive interdependence can be seen as a matter of national vulnerability- where participants may face significant costs if their relationship deteriorates (Baldwin, 1980).

While liberal scholars believe economic interdependence reduces political conflicts by incentivizing trade over aggression- the First and Second World Wars have demonstrated that high interdependence does not prevent war (Copeland, 1996).

The political and economic relations between the PRC and Brazil began centuries ago, but the end of the Cold War and the bipolar international order facilitated the development of broader relationships. Until the 1990s, Brazil's development was primarily financed by the US. Yet PRC has capitalized on diminishing US influence to expand its economic presence through economic instruments like trade, loans, and investments- facilitating Brazil's distancing from US, and creating favorable conditions for PRC's expansion.

Yet, there is limited literature on the PRC-Brazil collaboration in the renewable wind sector, thus it is helpful to examine the official perspectives from both sides by scrutinizing the official strategic initiatives and bilateral agreements between the two to assess the extent of the potential interdependencies derived from this cooperation.

To better understand Chinese perspectives, previous research has outlined the necessity of analyzing specifically the Chinese-language material through political discourse analysis examining official PRC's policies and strategies (Berzina-Cerenkova, 2024).

Economic cooperation directs PRC's foreign policy and prioritizes relations with other countries. Chinese and Brazilian scholars alike emphasize that this partnership is driven by the global shift transitioning toward renewable energy sources, exacerbated by escalating petroleum costs and environmental concerns associated with nonrenewable resources (Peng et al., 2019; Junior et al., 2019). Both states position the collaboration in renewable energy as an opportunity to enhance their efforts in sustainable energy production (Xie et al., 2021; Vardiero et al., 2020). As one of the world's largest carbon emitters, PRC's move towards clean energy is significant on a global scale. The latest PRC's *14th Five-Year Plan* (十四五规划)(2021-2025) underscores its commitment to innovation-driven, sustainable, and low-carbon renewable energy production from 2021 to 2025- aiming to cap PRC's CO_2 emissions by 2030 (Global Wind Energy Council, 2023). Yet, the rapid expansion of renewable energy projects in LA has raised concerns regarding the PRC's growing geopolitical and economic influence. Approximately 90% of renewable technologies in LA are produced with PRC support. PRC's dominance in renewable energy supply chains has raised international alarm, prompting LA countries to seek ways to secure sustainable energy resources independently (Myslikova & Dolton-Thornton, 2023).

Increased Chinese influence has sparked discussions on the security of global renewable energy supply chains and the associated risks of energy dependence. Since 2021, PRC has been the world's largest and fastest-growing renewable wind energy producer. As of January 2023, the PRC's total operational wind park capacity was 278,353 megawatts (MW), affirming its position as the global leader in the renewable energy sector (Maguire, 2023).

Moreover, PRC has made substantial investments in wind energy projects in Brazil, reflecting its long-term commitment to sustainable energy production in Brazil (Geng et al., 2021). The largest PRC investors in Brazil are the PRC state-owned enterprises (SOEs) such as *China Three Gorges Corporation* as well as private firms [albeit with significant government support and involvement] such as *Goldwind* and *Envision*. These enterprises are the key drivers of PRC-Brazil's collaboration in the renewable wind energy sector providing investments and technical expertise (Dudgeon, 2011). According to Chinese scholars, *Goldwind* and *Envision* investments in financing and developing wind energy projects in Brazil have led to economic benefits in both countries (Bai et al., 2010).

By mirroring practices in the US, to incentivize the development of wind farms Brazilian government has launched several fiscal programs. Noteworthy, these projects have been aligned with Brazilian national development goals for sustainable energy production (Hansen & Zambra, 2020).

PRC-Brazil wind energy collaboration is executed through various organizations and initiatives, focusing on partnerships and investments, especially in regions of Northeast Brazil (Chen et al., 2009). Chinese investments in Brazil are mostly channeled through Brazilian government initiatives such as the *Programme of Incentives for Alternative Electricity Sources* (PROINFA), which aims to increase the use of alternative energy sources and enhance Brazil's renewable energy capacity, by including wind, biomass, and

small hydroelectric power in Brazil's electricity mix. Through PROINFA Brazil has aligned wind farm development with the PRC's sustainable energy objectives (Ma et al., 2021). Thus, facilitating PRC's contributions to Brazil's renewable energy development (Deng et al., 2020; Wang et al., 2023). Chinese scholars emphasize that such joint policy shifts have created favorable conditions for future collaboration (Zhao et al., 2013). Yet, despite these positive developments, Chinese scholars admit that challenges such as cultural differences, regulatory barriers, and logistical issues persist, requiring enhanced strategic planning (Chen et al., 2009).

Additionally, Brazilian institutions such as the *Brazilian Electricity Regulatory Agency* (ANEEL) and the *Energy Research Office* (EPE) provide essential research data on renewable energy generation to PRC. Other mechanisms such as the *Auction of Alternative Sources* have been further institutionalized to promote this collaboration (Vardiero et al., 2020).

Brazilian scholars note that the technological transfer of PRC's wind turbine technology has boosted Brazil's renewable energy capacity and simultaneously contributed to advancing innovation in Brazil's local industries (Diagne et al., 2020).

Chinese scholars note that the main motivation for the PRC's collaboration with Brazil lies in strategic diversification attempts of PRC's energy investments abroad to enhance PRC's national energy security, in line with its broader geopolitical objectives (Han et al., 2015). The main policy framework governing this bilateral collaboration is executed through initiatives like the BRI, which is also the driving force of PRC's foreign policy (Deng et al., 2023).

As reported by the PRC's official *Belt and Road Energy Cooperation Network,* BRI is beneficial to Brazil as it aims to leverage its influence to enhance Brazil's national development strategies. For example, Brazil has announced ambitious plans for renewable energy development by 2030 aiming to increase the proportion of renewable energy in the country's energy matrix to 45%. Which includes a shift towards non-hydropower renewable sources like wind, solar, and biomass (一带一路能源合作网, 2019).

To Enhance infrastructure and energy sector collaborations, PRC-Brazil signed the *"Ten-Year Cooperation Plan*," (十年合作计划)(2012-2021) which allowed Brazil to align its national development strategies with PRC's renewable energy strategies under the BRI umbrella. This reflects Brazil's commitment to diversify its energy sources to support economic growth. BRI serves as the core platform for PRC to foster renewable energy cooperation with Brazil. During Xi Jinping's (习近平) visit to Brazil in 2014, a joint statement was issued that underscored the importance of renewable energy production for sustainable development (IIGF观点, 2019). In 2020, PRC's BRI investments in the renewable energy sector in Brazil accounted for 57% of total investments, in alignment with PRC's *"3060 carbon neutrality goals".* Furthermore, although Brazil is not an official member of BRI, PRC has actively advocated for Brazilian industries to join the initiative to *"leverage the BRI to foster sustainable, low-carbon growth through enhanced Sino-Brazilian cooperation in renewable energy sectors."*(巴西《经济价值报》, 2021).

As reported by PRC state-run *Xinhua News Agency,* a tangible example of PRC-Brazil collaboration is the 180-MW wind energy project in Bahia [Northeastern Brazil], developed by *China General Nuclear Power Group's Brazilian subsidiary*. Xinhua emphasizes that *"this project exemplifies the integration of economic and social benefits through shared development and technological advancements; [..] and that the project which was completed ahead of schedule has received positive recognition for PRC's contributions to the local renewable energy development in Brazil and thus has strengthened the two-state bilateral relations."*(罗婧婧, 2023).

Noteworthy, as Chinese scholars note, these interdependencies make them *economically* and *politically* dependent. Increased political engagement primarily arises from intensified bilateral interactions and economic impulse primarily stems from strengthening commercial ties. This mutual dependency has made political and economic relations more conventional and predictable (Guo, 2023).

Yet, Chinese and Brazilian academics alike view this collaboration as a positive-sum game, where both countries benefit- PRC gains access to Brazil's rich resources and opportunities for technological exchange, and Brazil gains Chinese investments and expertise in renewable energy technologies (Peng et al., 2019; Vardiero et al., 2020). According to Chinese scholars, this partnership is focused on achieving mutual environmental benefits while contributing to progress towards the UN's global Sustainable Development Goals (SDGs) (Shi et al., 2004).

The existing academic literature, while limited, recognizes that the PRC's collaboration with Brazil in the renewable wind energy sector is driven by strategic, economic, and geopolitical motivations. PRC's reliance on coal has supported its rapid economic development but also led to significant environmental issues like acid rain. PRC's strategies include investments, technology transfers, and policy support, with SOEs and private firms playing crucial roles. Despite challenges, both governments view this partnership as beneficial for sustainable development and bilateral relations. Although Brazil is not officially part of the BRI, its alignment with BRI-like development strategies facilitates Chinese investments in Brazil's renewable energy sectors, creating opportunities for asymmetric dependencies between the two countries.

3. Official PRC's Strategies

When PRC opened its economy to the world in 1978, it facilitated the growth of commercial interactions between PRC and global market. This process accelerated significantly after the PRC's admission to the WTO in 2001. The *"Going Out"* Policy (1999) was one of the first Chinese Communist Party's (CCP) strategies implemented to facilitate economic growth; aiming to promote Chinese investments abroad; and enhance access to foreign markets, natural resources, and advanced technologies to support the PRC's economic growth. It was launched in response to an internal crisis related to industrial overcapacity and in connection with the PRC's accession to the WTO. It aimed to promote the PRC's national interests globally by internationalizing PRC state financing and investments to ensure long-term access to energy and raw materials from abroad. From the PRC's perspective, this strategy aims to transform Chinese SOEs into corporations

with global reach (Jáuregui & González, 2022). Thus, this policy is a component of the PRC's overall national economic modernization strategy (Nash, 2012).

In March 2001, at the East Asia-Latin America Forum, the former PRC Foreign Minister Tang Jiaxuan (唐家璇) emphasized the need to foster the economic and political exchange between the two regions through the PRC's *"South-South"*(南南合作) framework (Ministry of Foreign Affairs of the People's Republic of China, 2001). Just a couple of months later in December 2001, PRC acceded to the WTO. Since then, its global strategy has consistently evolved (WTO, 2024).

The adoption of the *"Going Out"* Policy as part of the CCP's *10th Five-Year Plan* (第十个五年计划)(2001-2005), officially endorsed Chinese entities to enter international markets and resources. During this period, initially, only a few Chinese companies operated in Brazil that were supported by both governments to establish relationships and develop the necessary financial, legal, and physical infrastructure to facilitate Chinese company operations. In the following CCP's *11th Five-Year Plan* (第十一五规划)(2006–2010), CCP encouraged companies to *"Go further outwards."* (Policy Asia-Pacific Energy, 2024).

During this period, Chinese companies engaged in larger and more complex foreign investment transactions internationally, using strategies such as forming *joint ventures*; establishing *wholly owned subsidiaries*- particularly in the manufacturing sector; and focusing on *mergers and acquisitions* (M&A) that offer quick access to new markets and technologies.

One of the most significant changes over the past two decades is that Brazil has assumed an important role in PRC's global strategy. As identified from the literature review, building on these initial *"South-South"* collaborations, on June 21, 2012, in Rio de Janeiro, both parties signed a new strategic framework- the *"Ten-Year Cooperation Plan"* (十年合作计划)(2012-2022). This foundational document serves as a blueprint for the strategic partnership between PRC and Brazil; emphasizing technology, innovation, economic cooperation, and cultural exchanges, with a focus on renewable energy technologies, including wind energy (中华人民共和国商务部, 2012).

PRC's success in Brazil stems from a grand, well-calculated strategy that combines political impulses with economic resources. Since 2012, Xi Jinping has designated Brazil as a *"comprehensive strategic partner"*- the highest status of its kind. Since 2012, both country leaders have visited each other multiple times, Xi visited Brazil 3 times and Brazilian presidents have visited PRC 4 times. As Xi stated in 2017, *"Latin America is a natural extension of the 21st century Maritime Silk Road."*(Hobbs & Torreblanca, 2022).

Brazil possesses abundant natural resources- holding a significant share of the world's rare earth minerals (REEs) needed for renewable energy production- which makes Brazil an attractive region for wind energy development. While Brazil is leveraging these resources to enhance economic growth and improve energy security, it is also witnessing heightened PRC's involvement.

The *"Going Out"* Policy is undoubtedly part of the PRC's broader, more active foreign policy. However, the PRC's domestic economic conditions have also been a major driving

force. This includes growing challenges with the old growth model and changing relationships between the government, SOEs, and banks.

Overall, the *"Going Out"* Policy has yielded benefits both domestically and internationally, as capital flows that once came from the West are now reversing, creating mutual advantages. However, the impact of the PRC's investments and its broader *"Going Out"* Policy on the global political and economic order remains uncertain. Since the policy's introduction at the turn of the century, Chinese companies have increasingly invested and operated overseas. Initially a major recipient of FDI, PRC has now become a significant source of FDI abroad. For example, the *China Investment Corporation* (CIC)- PRC's largest sovereign wealth fund, was established in 2007 with $200 billion in investable assets which now has at least doubled (Nash, 2012). This shift exemplifies a substantial expansion of the PRC's financial influence beyond its borders. Chinese investments have increasingly targeted energy and raw materials sectors- which the PRC needs to maintain its domestic growth objectives. Significant FDI flows to resource-rich countries and regions, like Africa, Australia, Canada, LA, and Southeast Asia have raised global concerns that PRC may be attempting to hoard a dangerously large portion of the world's natural resources and implement a neo-colonial agenda that disregards human rights and humanitarian issues (Nash, 2012).

PRC's global strategy in renewable wind energy is supported by the *"Going Out"* Policy. For example, to establish wind farms Chinese wind turbine manufacturers enter new markets through *joint ventures* and *technology licensing* (Oxford Business Group, 2023). The *"Going Out"* development strategy has been significantly facilitated by the BRI infrastructure program- a complementary governmental effort launched in 2013 by Xi Jinping- which aims to create new opportunities for international cooperation through tangible large-scale infrastructure projects connecting Asia with other continents. However, there is a tendency to underestimate the obstacles facing the BRI, both domestically and internationally, leading to excessive optimism from its supporters and exaggerated concerns from those fearing wider PRC influence globally (Wang, 2016).

While BRI offers opportunities for infrastructure development and economic growth in LA, it also presents challenges and risks that must be carefully managed. PRC's ambitious investments in the region strengthen its influence over global supply chains, creating new challenges and opportunities in renewable energy development and geopolitical stability. Although Brazil is not part of BRI, Brazil must engage with BRI in ways that maximize benefits and minimize risks.

PRC-Brazil collaboration in renewable wind energy sector is executed through strategic frameworks like the *"Ten-Year Cooperation Plan"* [as part of BRI] and the *"Going Out"* Policy. These frameworks facilitate the PRC's economic presence by establishing infrastructure projects and trade routes between PRC and Brazil. These initiatives have facilitated significant investments and technological integration, contributing to Brazil's renewable energy goals, while the primary goal of these initiatives is to ultimately transform Chinese SOEs into global corporations.

4. PRC's Energy Diplomacy and Security Implications

Energy security is a global issue and a concern of national security; only few countries can ensure independent supply. As a large developing country with over 1.3 billion people, PRC's energy needs are projected to grow significantly, and PRC must continually increase its energy supply to meet these demands. The *"Going Out"* Policy and the BRI have significantly influenced the global energy market through extensive external investments and rapid growth in the renewable energy sector. As a leader in wind and battery technology, exemplified by companies like BYD (比亚迪汽车), PRC competes robustly in the global technology market challenging other nations in transitioning to renewable energy (Hilton, 2024).

Energy security remains a significant concern for PRC- influencing both its domestic and international energy strategies. Energy investments are a critical component of the PRC's diplomacy, representing its initial multilateral approach to establishing global influence. Bilateral relations with resource-rich regions, such as Africa, Central Asia, and LA, reflect a nuanced strategy tailored to the specific characteristics and ideological preferences of each country.

PRC's energy diplomacy utilizes a concept of *resource diplomacy*, defined by David Zweig as *"diplomatic actions aimed at enhancing nation's access to resources and its energy supply security"* (Oxford Business Group, 2023). *Resource security* involves ensuring a stable provision of energy at affordable prices and the ability to transport these resources efficiently.
PRC's *"New Security Concept"* (新安全观), declared in 1996, emphasized that energy is a *primary national interest* and that *acquiring foreign resources is essential for achieving this goal*. While some Western analysts view PRC's overseas energy investments as a means to expand its hegemony, Chinese scholars argue that these investments are primarily focused on securing energy supplies (Oxford Business Group, 2023; Zhou, 2015). Thus, it could be argued that PRC's energy diplomacy is driven by both resource security and economic growth, rather than solely by climate change concerns.

PRC's bilateral relations with Brazil illustrate complex interdependence, with significant investments in Brazil's wind energy sector fostering mutual influence. PRC's strategy targets both energy-rich and developed countries to secure its vast energy needs. Chinese analysts distinguish between "energy security" and "energy sufficiency," noting that since the 1970s while PRC lost self-sufficiency in energy, it has improved its energy supply security through international cooperation (Aggarwal, 2022).

Chinese companies have rapidly expanded across Brazil, implementing projects and providing materials to local companies to boost renewable energy production. Chinese loans and investments finance numerous infrastructure, energy, and mining projects. PRC's extensive involvement in Brazil's energy sector is part of a broader strategy to expand its influence in LA. From 2000 to 2019 PRC invested over $58 billion in the LA region's energy industry (Instituto de las Américas, 2024).

PRC's drive towards renewable energy and obtaining critical minerals is driven by large-scale purchases and international tenders won by Chinese companies. For example, in

2020 Chinese M&As in the LA energy sector reached $7.7 billion, underscoring its strategic vision for increased global economic influence (Bloomberg, 2020). Supported by Chinese banks, Chinese renewable energy equipment suppliers have penetrated LA markets by offering low-cost, competitive technologies. This state financial backing has facilitated the development of renewable energy projects, even in the face of local regulatory challenges (Instituto de las Américas, 2024).

This strategic involvement while beneficial, raises concerns about economic and political dependencies on the PRC. Excessive reliance on Chinese investments could lead to vulnerabilities in local markets and labor sectors. As PRC plays a leading role in global wind energy development, its substantial investments and exports of wind turbines in Brazil underscore its influence in the renewable energy sector. This strategy of capital flow highlights Brazil's growing dependence on Chinese technologies and financial resources, enabling PRC to expand its global market presence in wind energy development. Therefore, it is crucial for Brazil to develop its own energy technologies and promote local businesses to ensure a sustainable and independent energy supply.

5. PRC Investments

PRC operates as a non-traditional partner and is a valuable external stakeholder for Brazil. Chinese investments, trade, and relations with Brazil have exacerbated over the last decade. PRC invests across various sectors and these investments generally align with the publicly stated CCP objectives. From 2000 to 2020, the trade value between PRC and Brazil increased from $1.3 billion to over $90 billion by 2020, marking a 69.2-fold increase (Atlantic Council, 2021). Projections suggest that by 2035, this trade volume will exceed $700 billion (Atlantic Council, 2021). Currently, PRC is Brazil's largest trading partner (King's College London, 2022).

The key element of PRC's economic growth has been government support- enabling Chinese SOEs to gain market shares in strategically important sectors. Recently, this support has shifted towards advancing green energy production (Ellis, 2024). Over the past decade, PRC companies have advanced in the development of critical green energy sectors, including hydroelectric, solar, wind, EV manufacturing, energy storage, and transmission. The strengthened positions of Chinese SOEs in these areas enable PRC to gain substantial profits and strategic leverage as governments worldwide transition from fossil fuels to green energy (Ellis, 2024).

Companies supported by CCP government and banks have been key investors in LA's wind energy sector. In 2008 and 2016, PRC issued two policy documents, reflecting Beijing's strategic importance in LA region. They have facilitated the region's transition to renewable energy, as approximately 90% of all wind and solar technology installed in LA is produced by Chinese companies, or partners financially backed by PRC banks. This increasing dominance of PRC suppliers means that a disproportionately large share of renewable energy projects in the region, directly or indirectly benefit PRC. These PRC companies, financed by Chinese banks, use low-cost turbines and other equipment, with technology largely appropriated from European partners (Ellis, 2024).

For example, in the 2023 ranking of wind turbine manufacturers *Goldwind* [PRC], took first place with 16.4 GW of projects, followed by *Envision Energy* [PRC] with 15.4 GW. Next were *Vestas Wind Systems* [Denmark] with 13.4 GW, *Winday* [PRC] with 10.4 GW, and *Mingyang* [PRC] with 9.0 GW, surpassing the popular *General Electric* [US], which had 8.1 GW (Evwind.es, 2023). However, these gradually growing investment projects have been associated with security and environmental issues.

Furthermore, the entry of Chinese companies into the region as "local participants" has changed the business and political environment. In Brazil, on the one hand, it created new opportunities for local stakeholders to access Chinese capital for large-scale projects. On the other hand, it triggered a defensive reaction from domestic actors, who perceived themselves as threatened. Other types of investments include FDIs, where PRC companies either acquire local businesses or establish local branches or factories, and local investment financing with PRC funds.

During a speech at the first summit of PRC and the *Community of Latin American and Caribbean States* (CELAC) (2015), Xi Jinping indicated that over the next decade, Chinese investments in the region could increase to $250 billion. He emphasized that in recent years, the PRC has become not just a trading partner and lender to the region but an increasingly significant investor, increasing the physical presence of its companies and people in the region (Ellis, 2018).

The maturation of economic relations, due to accumulation of experience by Chinese companies operating in the region has merged with new international confidence in Xi Jinping's government to position Chinese companies for new achievements. On the other hand, the new protectionism discourse emanating from Donald Trump's administration in the US (2017-2021), and its public rhetoric on issues such as immigration, has confused and alienated important industries in LA, increasing the political desire to cooperate with PRC, although not everyone in the region is ready to welcome PRC with confidence and enthusiasm. The presence of PRC-backed companies and citizens working in Brazil has raised concerns about the socio-political conditions, laws, and policies in the region, which now impact the operations, profits, and security of these companies.

For example, in Brazil since 2003, Chinese companies have implemented 87 projects worth $46.8 billion (Ellis, 2018). This new role of investor increases PRC's political influence in the region and also acquaints CCP with complex decisions about how and when to use its growing influence to protect and promote the interests of its companies in the region, adhering to the principles of "non-interference" in the sovereign affairs of LA countries (Ellis, 2018). In this process, the PRC positions itself as an actor historically and politically located in the Global South. It has achieved a significant role in the development of renewable energy in LA, directly influencing global strategic positioning. Consequently, LA is being shaped as a strategic platform for PRC's positioning in the Western Hemisphere. For example, Zhang, Y. discusses that the geostrategic projection from Beijing to LA is embedded in a global vision where the "developing world" or the Global South is seen as a political support base for the major project of restoring PRC's power at *"la base"* (Ellis, 2018). Thus, PRC's growing significance in LA within the Global South sphere holds strategic and symbolic importance.

This unveils two directions explaining the systematic entry of Chinese economic diplomacy into LA. On one hand, the geopolitical element seeks to expand PRC's spheres of influence, including its efforts to internationally isolate Taiwan. This pattern of behavior benefits from the PRC's inevitable commercial dynamism, which involves a geo-economic strategy aimed at capturing LA's markets, energy, natural resources, minerals, and REEs (Ellis, 2018).

Reevaluating its bureaucratic orientation and belief in central planning, CCP forms relationships with countries through carefully crafted and announced plans and policies, intended for both domestic and international audiences. The government possesses numerous political and institutional levers to coordinate its conduct even abroad. For Chinese companies, government plans and policies are akin to the Northern Star crucial in guiding their actions and indicating which activities abroad are officially approved and prioritized. For Chinese companies, an important reference from the *"Going Out"* Policy is the 2008 *"White Paper"* (中国对拉丁美洲和加勒比政策文件) on LAC states, which outlined CCP's intentions to develop interactions across almost all sectors, ranging from political and economic to military, considering a wide range of sectors to promote trade and investment exchanges with the region.

Another significant policy indicating the CCP's approach was the "1+3+6" trade interaction concept (中拉"1+3+6"合作新框架) announced by Xi Jinping in July 2014, during his visit to Brazil for the BRICS summit in Fortaleza. Where Xi emphasized the unified nature of Chinese operations in LA, along with the three main means of implementation, which are *trade*, *loans*, and *investments*, and the six key sectors that were their operational priorities in the region, including- *energy and natural resources*, *infrastructure construction*, *agriculture*, *manufacturing*, *science and technology innovations*, and *information technology*. The "1+3+6" concept was also incorporated into the PRC-CELAC cooperation plan (2015-2019), which was intended as a roadmap for fostering relations with PRC. Both were mentioned in the second "White Paper" on PRC's policy towards LA, published in November 2016, highlighting that the priority of these six economic areas is an official government policy to direct Chinese investments, loans, trade, and other activities in the region.

At the national level, investments and other commercial activities are also promoted and managed through state diplomacy, incorporating official visits, memorandums of understanding, and other agreements, as well as the establishment and management of contracts and "strategic partnerships". This process is fundamentally based on diplomatic recognition. With few exceptions, official relations are necessary for the Chinese government to approve loans and set investment priorities in a country. Similarly, diplomatic relations facilitate the participation of Chinese SOEs in national tenders in the host country. For example, changes in diplomatic relations, recognizing PRC combined with its role as a logistics and financing center for the entry of Chinese products into the region, could open doors for significant Chinese company investments and projects in the country. Chinese investments in renewable energy are considered the most significant opportunity to expand trade between Asia and LA. Simultaneously, increasing

oil and gas extraction in US has prompted major Chinese renewable energy companies to seek more attractive alternatives.

6. Prospects for Mutual Interdependence

Since 1993, PRC and Brazil have recognized the potential for a strategic long-term partnership, emphasizing their shared identities as major developing nations. Brazil has consistently ranked among the PRC's top trading partners and serves as a key destination for Chinese FDI. From 2012 to 2023, PRC was Brazil's leading trading partner, accounting for 22% of Brazil's trade in 2023, amounting to $55 billion, compared to 15.9% ($40 billion) with the US- Brazil's second-largest trading partner (TrendEconomy, 2024). According to data from the International Energy Agency (IEA), Brazil appears to be a country where PRC is investing significant resources in clean energy production in LA (Diálogo Chino, 2024).

Although Brazil is not a member of the BRI, it is a member of the *Asian Infrastructure Investment Bank* (AIIB). The PRC-Brazil partnership is marked by expanding commercial ties and significant Chinese loans and investments. Since 2007, the *China Development Bank* (CDB) and the *Export-Import Bank of China* (EXIM) have extended over $28 billion in loans to Brazil, primarily directed toward the energy sector (Gallagher & Myers, 2020).

Brazil's commitment to renewable energy began with the 1997 *"Law 9478",* establishing the basis of its national energy policy. This evolved into the *"Ten-Year Energy Expansion Plan"* (PDE), emphasizing the development of wind energy to reduce reliance on fossil fuels. The PDE 2031 projects that renewable energy sources will comprise about 56% of Brazil's total energy matrix by 2031 (Ministério de Minas e Energia, Secretaria de Planejamento e Desenvolvimento Energético, 2022).

In 2002, Brazil launched the PROINFA to promote wind, biomass, and small-scale hydropower energy (IRENA, 2015). This was later replaced by the Power Purchase Agreement (PPA) auction procurement process, overseen by the *Brazilian Electricity Regulatory Agency* (ANEEL). Noteworthy, the expansion of renewable energy aligns with the PRC's *"Going Out"* Policy, making the PRC a significant investor in this sector.

From 2015 to 2019, Chinese FDI in Brazil reached $25.9 billion, with wind energy comprising 72% of this investment. This cooperation has elevated Brazil-PRC energy sector collaboration to new heights, with substantial capital from Chinese investors, manufacturers, engineering service providers, and financial institutions (Barbosa, 2020).

Chinese investments in Brazil's wind energy sector are driven by the notable complementarity between the two countries. Brazil's abundant resources, expanding capacity needs, and favorable market conditions align well with PRC's financial power and technological capabilities. This synergy has facilitated Chinese enterprises' entry into Brazil, exemplified by the investments and operations of companies like *State Grid Corporation of China* (SGCC), *China General Nuclear Power Group* (CGN), and *China Three Gorges Corporation* (CTG) (Barbosa, 2020).

Brazil's wind energy sector has also benefited from PRC bank loans. For example, the CDB granted a $56 million loan to *Desenvix Energias Renováveis* for constructing *the Barra dos Coqueiros* wind farm in 2012. Such investments have allowed Chinese companies to gain control over significant portions of Brazil's wind energy capacity, aligning future operations with their interests (Ellis, 2024).

The PRC's active involvement in Brazil's [and wider LA's] energy markets reflect CCP's strategic vision for increased global economic strength. Through significant financial investments and project acquisitions, PRC has established close economic and political ties with LA countries, becoming a key player in the energy market. Such Chinese influence could pose threats to the energy security of Brazil and other LA countries.

Elizabeth C. Economy notes, *"Xi is the first Chinese leader to align the country's capabilities with vision and strategy to realize the ancient 'Chinese dream of national rejuvenation'. CCP is not satisfied with China's position in the international system. They seek to change the world order."* (Elizabeth C. Economy, 2021).

Similar notions are exemplified by the former Peruvian presidential candidate Julio Armando Guzmán who noted that, *"The Chinese attitude towards LA has changed. Initially, China's influence was primarily based on soft power, trying to convince LA countries that China's rise would benefit the region. Now, however, China is willing to impose its power and use hard force to try to make countries do what it wants."* (Pettus, 2023).

According to Pedro Barbosa, PRC companies own 12% of Brazil's wind energy production, transmission, and distribution segments, making PRC the most significant foreign investor in this sector. This dominant role could lead to political influence, with security experts highlighting risks if PRC companies monopolize the electricity sector from production to transmission and retail. Thus, it could be argued that the PRC establishes asymmetric and coercive economic ties with other countries and uses these ties to deeply influence local and national governments. The PRC may have been conducting comprehensive government efforts for years, serving its objectives and undermining democratic principles through involvement in LA. From policy analysis, it is evident that PRC's strategy in Brazil's renewable wind energy sector fosters mutual dependency through investments, technology transfer, economic growth, and energy security. The PRC's greater resources and financial capabilities may create asymmetry, allowing PRC to control projects and gain advantages, making Brazil more dependent on Chinese investments and technologies, thus creating an imbalance in opportunities and influence. *Interdependence* in global politics involves mutual influence between countries; Keohane and Nye's theory of interdependence asserts that global politics is shaped by "complex interdependence" among states, non-state actors, and transnational issues. They emphasize the importance of power and interests intertwined with economic and social interdependence (Keohane & Nye, 1977).

PRC's strategy involves diverse connections, beyond governmental ties, including business relationships, non-governmental involvement, and multinational participation (Rana, 2015). In the renewable wind energy sector, PRC and Brazil exhibit mutual interdependence through trade partnerships, technology transfer, and joint ventures.

PRC's investments in Brazil's wind energy projects highlight this interdependence, creating economic and political linkages.

PRC's foreign and economic strategy in bilateral relations with Brazil is based on diverse connections, including liberal market principles and national interests. This institutionalized system indicates that PRC's policymaking and actions with Brazil depend on both international trade principles and national strategies. The main objective of this cooperation is to ensure a steady supply of energy resources, natural minerals, and REEs to support PRC's economic growth and development, particularly in renewable wind energy.

Nye and Keohane identified three main features of "complex interdependence"- *multiple channels, the irrelevance of military power,* and *the importance of international institutions*. These features are evident in PRC-Brazil relations, particularly in the wind energy sector. PRC's significant economic and political influence is highlighted, emphasizing the mutual benefits and potential risks of this bilateral partnership. Keohane (1984) states that *"power is no longer used to consider behavior; rather, it provides the language for describing political action."* This means military power is less important, while language and communication are crucial for understanding PRC-Brazil relations. Complex interdependence aligns with renewable energy and energy security concepts. PRC's institutional ties with Brazil are executed through investments, cooperation, and policy frameworks in the renewable wind energy sector, therefore the institutional context is crucial for understanding PRC-Brazil relations- suggesting that military power is not the sole factor influencing IR.

Economic interdependence between PRC and Brazil includes trade, acquisition of wind farms, investments in wind projects, manufacturing components, and control over power grids. This interdependence is also tied to *resource security*, as PRC seeks access to Brazil's natural resources, including minerals, lithium, and REEs essential for renewable energy development. PRC's cooperation with Brazil significantly contributes to the development of Brazil's renewable energy sector, including the construction and operation of wind farms. However, this raises energy security issues, as PRC's energy policies impact Brazil, making Brazil vulnerable to PRC's decisions in the energy sector. Addressing this cooperation is essential to balance the asymmetry of mutual dependence, thereby reducing Brazil's *sensitivity* and *vulnerability* to PRC. Keohane and Nye (1977) distinguish between *sensitivity*- the response to costly external impacts before policy changes occur, and *vulnerability*- which arises when a nation's welfare depends on the behavior of others. Despite PRC's partial *vulnerability* and *sensitivity*, asymmetrical mutual dependence in energy relations between Brazil and PRC functions as a source of power for PRC and a potential threat to Brazil's energy security.

PRC's investments in Brazil's wind energy sector demonstrate the interaction of economic, political, and strategic interests. These investments reflect a form of mutual economic dependence, benefiting all parties through cooperation and shared resources. However, this mutual dependence also raises concerns about asymmetric dynamics, potential dependency risks, and PRC's influence over Brazil's wind farms and energy

resources. While PRC has diversified its international relationships, Brazil is significantly engaged with PRC, relying heavily on Chinese investments and production.

7. Insights from International Renewable Wind Energy Experts

In the context of this study, interviews were conducted with six diverse international experts from the renewable energy industry to gauge the prospects for potential interdependencies. These experts, who have chosen to remain anonymous, hail from various companies and hold different professional titles. Two of the interviewees are high-ranking employees from *Goldwind*-a company backed by PRC. Another two hail from *Siemens Gamesa Latam* and *Central Puerto Renovables*, companies operating in LA, and headquartered in Spain and Argentina, respectively. The last two interviewees are high-level managers from two separate renewable wind energy companies, based in Denmark and operating in Taiwan. They represent both local Taiwanese and European professionals working in Taiwan.

The experts' views on PRC's involvement in the global wind energy sector, with an emphasis on their collaboration with Brazil and the potential for dependencies, were diverse. Post-interview, a dichotomy emerged between the perspectives of experts working within Chinese companies and those employed by European and LA counterparts. This dichotomy was particularly evident about mutual interdependence. Representatives from *Goldwind* expressed hope for an increased PRC presence in LA, asserting that PRC-made engines match the quality of their European equivalents.

However, when discussing the influence and collaboration between the PRC and other nations, a divergence of perspectives surfaced. While representatives from Chinese companies [engineer and a high-level manager from *Goldwind*] expressed optimism about PRC's involvement and dismissed dependency concerns, representatives from non-Chinese financed companies expressed caution. While acknowledging the competitiveness of Chinese technology, these experts, from *Siemens Gamesa LATAM* and *Central Puerto Renovables*, showed a preference for European technology and investments, citing their proven quality over the years. They also underscored the need for strategic caution to prevent potential monopolization.

The discourse around mutual interdependence was a recurring theme in these interviews. While PRC's technological advancements and financial investments substantially contribute to the renewable energy sector, the experts emphasized the need for balance to avoid over-dependence. They suggested multiple strategic recommendations, including diversification of investment and technology sources, bolstering local manufacturing, promoting competitive supply chains, establishing robust policy and legal frameworks to facilitate market entry for international companies, and conducting ongoing quality and reliability assessments of imported technologies.

Interestingly, all the experts from non-Chinese companies admitted to not being concerned about the PRC posing risks in the global wind energy market. They maintained that their respective companies have their own vision for the future, implying an inherent confidence in their strategic direction and resilience.

Conclusions

In conclusion, this study analyzed the complex dynamics of the PRC's engagement in Brazil's renewable wind energy sector. This article aimed to answer the research question of *how the PRC's renewable wind energy strategy in Brazil contributes to creating strategic dependencies and potential vulnerabilities associated with reliance on Chinese capital*?

Our analysis reveals that while the PRC's strategy has indeed fostered significant collaboration and growth in this field, it has also led to the creation of strategic dependencies and potential vulnerabilities for Brazil. The relationship between the two nations in this sector is characterized by mutual interdependencies, but these are notably asymmetrical in nature. Brazil has become increasingly reliant on Chinese capital and technology, whereas the PRC's dependencies on Brazil are comparatively minor. This imbalance underscores the potential risks associated with Brazil's growing dependence on Chinese resources in its renewable energy development.

In 1996, PRC introduced its "*New Security Concept"* emphasizing energy as central to PRC's national interests and prioritizing the acquisition of foreign resources. As one of the world's largest economies and leading energy consumers, PRC is also at the forefront of renewable energy. PRC's cooperation with Brazil in the renewable wind energy sector is driven by strategic factors, including- resource availability, market expansion, technology transfer, climate goals, and geopolitical aims.

To sum up, PRC's *"Going Out"* Policy has advanced bilateral ties with Brazil. This strategy promotes long-term overseas investments and cooperation to access energy and raw materials while institutionalization of BRI has increased investments in infrastructure projects such as wind farms and mineral extraction.

Brazil's vast land areas, especially in the Northeast, are suitable for wind farms, and its commitment to renewable energy aligns with PRC's objectives. As one of LA's largest economies, Brazil's energy development is crucial for PRC. The establishment of numerous wind energy parks and the increase in Chinese investments have resulted in rapid growth of FDI in renewable energy. To further its interests in the wind energy sector, PRC has acquired many of Brazil's largest wind farms and established joint ventures.

Brazilian government policies, such as wind energy auctions, have been instrumental in this collaboration. Consequently, Chinese companies have become major investors in Brazil's renewable wind energy sector, both in terms of financial investment and raw material supply. However, this electricity sector faces risks like monopolistic control of Chinese companies.

Our findings affirm the initial *central argument* that the PRC's involvement results in strategic dependencies for Brazil, aligning with the theoretical framework presented earlier in this paper. However, it is important to note that these interdependencies created by the PRC-Brazil cooperation in the renewable wind energy sector while asymmetric, are not insurmountable. This cooperation results in greater dependencies for Brazil compared to the PRC. It is important to also emphasize that while this

partnership does create certain dependencies for the PRC, these are relatively minor when compared to those experienced by Brazil.

To address these challenges, we have proposed several policy recommendations aimed at helping Brazil mitigate risks and ensure sustainable development and energy security. These strategies are designed to leverage the benefits of international collaboration while safeguarding national interests and reducing vulnerabilities. As the global energy landscape continues to evolve, Brazil must navigate these partnerships strategically, balancing the advantages of foreign investment and technology transfer with the imperative of maintaining autonomy and resilience in its renewable energy sector.

In the future, Brazil should ensure Chinese compliance with local laws and renewable energy policies, while evaluating whether Chinese-financed projects support Brazil's renewable energy, economic growth, and SDGs. Prioritizing local companies for wind farm construction and energy production in renewable energy auctions could be beneficial. Brazilian specialists and engineers should ensure the operation of wind farms and manufacture quality parts that could compete internationally. Brazil should leverage Chinese investments to expand its national electricity transmission systems, crucial for meeting domestic needs. However, it is important that Chinese companies do not fully control these transmission enterprises, as this poses a significant threat to Brazil's energy supply security. A potential solution for Brazil might be diversifying flexible deals based on national interests with other major powers, partners, and economies. Although, attracting FDI requires a series of measures, such as the implementation of clear regulatory frameworks, streamlining of administrative procedures, and close cooperation with development institutions- such robust economic growth can be secured with strategic energy policy and resource development.

References

Aggarwal, P. (2022). *China's energy security: The journey from self-sufficiency to global investor.* https://books.google.lv/books?hl=lv&lr=&id=kYNyEAAAQBAJ&oi=fnd&pg

Atlantic Council. (2021). *China-LAC Trade: Four Scenarios in 2035.* Atlantic Council. https://www.atlanticcouncil.org/in-depth-research-reports/report/china-lac-trade-four-scenarios-in-2035/

Bai, S., Wang, J., Lv, G., Zhou, P., Hou, S., & Xu, S. (2010). *Gis-based logistic regression for landslide susceptibility mapping of the Zhongxian segment in the Three Gorges Area,* China. *Geomorphology*, 115(1-2), pp. 23-31. https://doi.org/10.1016/j.geomorph.2009.09.025

Baldwin, A. David. (1980). *Interdependence and power: A conceptual analysis.* https://dbaldwin.scholar.princeton.edu/sites/g/files/toruqf4596/files/dbaldwin/files/baldwin_1980_interdependence_and_power_-_a_conceptual_analysis.pdf

Barbosa, H., & Pedro, H. (2020). *New Kids on the Block: China's Arrival in Brazil's Electric Sector.*https://www.bu.edu/gdp/files/2020/12/GCI_WP_012_Pedro_Henrique_Batista_Barbosa.pdf

Berzina-Cerenkova, U.A. (2023). *Introduction, Discourse, Rhetoric and Shifting Political Behaviour in China.* Routledge, ISBN 9781032537559

Busel, R. (2022). *La geopolítica de China, Rusia y Estados Unidos en la transición energética mundial.* https://www.linkedin.com/pulse/la-geopol%C3%ADtica-de-china-rusia-y-estados-unidos-en-transici%C3%B3n-busel/

CEBC (2022). *Investimentos Chineses no Brasil.* https://www.cebc.org.br/investimentos-chineses-no-brasil/

Chen, H., Yuan, W., Yuan, X., Gao, Y., Wu, N., & Zhu, D. (2009). *Methane emissions from newly created marshes in the drawdown area of the three gorges reservoir. Journal of Geophysical Research: Atmospheres*, 114(D18). https://doi.org/10.1029/2009jd012410

Climatscope. (2023). *Power Transition Factbook.* https://www.global-climatescope.org/sectors/power/

Coate, A. Roger, Griffin, A. Jeffrey, Elliott-Gower, Steven. (2017). *Interdependence in International Organization and Global Governance.* https://oxfordre.com/internationalstudies/display/10.1093/acrefore/9780190846626.001.0001/acrefore-9780190846626-e-110

Cohen, A. (2021). *China's journey to the center of the Earth - For rare minerals.* https://www.forbes.com/sites/arielcohen/2021/09/09/chinas-journey-to-the-center-of-the-earth-for-rare-minerals/

Committee on Foreign Affairs. (2022). *China regional snapshot: South America.* https://foreignaffairs.house.gov/china-regional-snapshot-south-america

Copeland, Dale. C. (1996). *Economic Interdependence and War: A Theory of Trade Expectations.* https://direct.mit.edu/isec/article-abstract/20/4/5/11525/Economic-Interdependence-and-War-A-Theory-of-Trade?redirectedFrom=fulltext

Dannreuther, R. (2011). *China and global oil: Vulnerability and opportunity.* https://www.jstor.org/stable/41306994

Deng, H., Fang, L., Zhang, L., Yan, X., Wang, F., Hao, X., … & Zheng, P. (2023). *A comprehensive content analysis of 104 Chinese electronic cigarette manufacturing enterprise official websites.* Tobacco Control, tc-2022-057759. https://doi.org/10.1136/tc-2022-057759

Deng, Q., Jian-jun, G., Ge, D., He, S., Jiang, B., Li, X., … & Ye, Y. (2020). *Modern optimization theory and applications.* Scientia Sinica Mathematica, 50(7), p. 899. https://doi.org/10.1360/ssm-2020-0035

Diagne, C., Catford, J. A., Essl, F., Núñez, M. A., & Courchamp, F. (2020). *What are the economic costs of biological invasions? a complex topic requiring international and interdisciplinary expertise.* NeoBiota, 63, pp. 25-37. https://doi.org/10.3897/neobiota.63.55260

Diálogo Chino (2024). *China pisa fuerte en la energía renovable de América Latina.* https://dialogochino.net/es/clima-y-energia-es/7729-china-pisa-fuerte-en-la-energia-renovable-de-america-latina/

Dudgeon, D. (2011). *Asian river fishes in the anthropocene: threats and conservation challenges in an era of rapid environmental change.* Journal of Fish Biology, 79(6), pp.1487-1524. https://doi.org/10.1111/j.1095-8649.2011.03086.x

Ellis, E. (2024). *Is China Cornering the Green Energy Transition in Latin America?* https://dialogo-americas.com/articles/is-china-cornering-the-green-energy-transition-in-latin-america/

Ellis, R. E. (2018). *Hacia una asociación estratégica: Las inversiones de China en América Latina.* https://chinayamericalatina.com/wp-content/uploads/2022/05/WP3-Mar-2018-REDCAEM.pdf

Energía & Negocios.com. (2023). *Informe CEA: la industria eólica global instaló 117 GW de capacidad en 2023.* https://www.energiaynegocios.com.ar/informe-cea-la-industria-eolica-global-instalo-117-gw-de-capacidad-en-2023/

Evwind.es. (2023). *Goldwind to supply wind turbines for wind farm in Brazil.* https://www.evwind.es/2023/02/13/goldwind-to-supply-wind-turbines-for-wind-farm-in-brazil/90191

Evwind.es. (2024). *China dominates the top 5 in the BNEF wind turbine manufacturers ranking for wind energy in 2023.* https://www.evwind.es/2024/03/27/china-dominates-the-top-5-in-the-bnef-wind-turbine-manufacturers-ranking-for-wind-energy-in-2023/97526#:~

Gallagher, K., & Myers, M. (2020). Scaling back: Chinese development finance in LAC, 2019. https://www.thedialogue.org/wp-content/uploads/2020/03/Chinese-Finance-to-LAC-2019.pdf

Geng, F., Wang, Q., Song, K., Hao, W., & Jiang, B. (2021). Visible-light-driven photocatalytic kharasch-type addition of 1,6-enynes. Chinese Journal of Organic Chemistry, 41(12), p. 4815. https://doi.org/10.6023/cjoc202106014

Global Wind Energy Council. (2023). *Global Wind Report 2023.* https://gwec.net/wp-content/uploads/2023/04/GWEC-2023_interactive.pdf

Guo, J. (2023). *The political economy of China–Latin America relations: The making of a post-boom paradigm.* https://link.springer.com/article/10.1007/s42533-023-00126-5

Han, L., Gao, B., Zhou, H., Xu, D., Wei, X., & Gao, L. (2015). *The spatial distribution, accumulation and potential source of seldom monitored trace elements in sediments of Three Gorges Reservoir, China.* Scientific Reports, 5(1). https://doi.org/10.1038/srep16170

Hansen, L. and Zambra, D. (2020). *An overview about the Brazilian photovoltaic market development.* Journal of Power and Energy Engineering, 08(08), pp. 73-84. https://doi.org/10.4236/jpee.2020.88006

Hilton, I. (2024). *How China became the world's leader on renewable energy.* https://e360.yale.edu/features/china-renewable-energy

Hobbs, C., & Torreblanca, J. I. (2022). *Byting back: The EU's digital alliance with Latin America and the Caribbean.* https://ecfr.eu/publication/byting-back-the-eus-digital-alliance-with-latin-america-and-the-caribbean/

IEA.org. (2024). *Mineral requirements for clean energy transitions.* https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/mineral-requirements-for-clean-energy-transitions

IIGF [观点.] (2019, August 20). 中国与"一带一路"沿线国家巴西的可再生能源合作及投融资 *China and Brazil's renewable energy cooperation and investment along the Belt and Road countries.*中央财经大学绿色金融国际研究院 [Central University of Finance and Economics, International Institute of Green Finance]. Retrieved in July 2024, from: https://iigf.cufe.edu.cn/info/1012/1271.htm

Instituto de las Américas. (2024). *China Afirma su Incidencia en el Sector Energético Latinoamericano: Lo que significa para la región, los Estados Unidos y Beijing.* https://biblioteca.olade.org/opac-tmpl/Documentos/cg00916.pdf

International Energy Agency. (2011). *Technology Roadmap: China Wind Energy Development Roadmap 2050*. https://iea.blob.core.windows.net/assets/8c00f1d3-8054-4e4f-b81f-2b7a23619167/TechnologyRoadmap-ChinaWindEnergyDevelopmentRoadmap2050.pdf

IRENA Policy and Measures Database. (2015). *Programme of Incentives for Alternative Electricity Sources* - Programa de Incentivo a Fontes Alternativas de Energia Elétrica – PROINFA. https://www.iea.org/policies/4019-programme-of-incentives-for-alternative-electricity-sources-programa-de-incentivo-a-fontes-alternativas-de-energia-eletrica-proinfa

Jáuregui González, Juliana. (2022). *Financiamiento e inversiones de China en energías renovables en la Argentina.* https://ri.conicet.gov.ar/bitstream/handle/11336/206179/CONICET_Digital_Nro.dac60568-8071-4781-9dfe-a6fc8c6be0b7_C.pdf?sequence=5&isAllowed=y

Junior, P., Fischetti, E., Araujo, V., Peruchi, R., Aquila, G., Rocha, L., & Lacerda, L. (2019). *Wind power economic feasibility under uncertainty and the application of ann in sensitivity analysis.* Energies, 12(12), p. 2281. https://doi.org/10.3390/en12122281

Keohane, Robert O. (1984). After hegemony: *Cooperation and discord in the world political economy.* https://www.academia.edu/84097992/Robert_O_Keohane_After_Hegemony_Cooperation_and_Discord_in_the_World_Political_Economy_Princeton_Univ_Pr_1984

Keohane, Robert, & Nye, Joseph. (1977). *Power and interdependence: World politics in transition*. Boston: Little, Brown & Co.

Keohane, Robert, & Nye, Joseph. (2001). *Power and Interdependence.* https://www.tandfonline.com/doi/abs/10.1080/00396337308441409

King's College London. (2022). *Brazil-China Trade Relations*. https://www.kcl.ac.uk/lci/assets/kssppolicypaper0122-brazil-china-trade.pdf#:~:text=URL%3A%20https%3A%2F%2Fwww.kcl.ac.uk%2Flci%2Fassets%2Fkssppolicypaper0122

Ma, Y., Shi, R., & Zhang, T. (2021). *Research progress on triphase interface electrocatalytic carbon dioxide reduction.* Acta Chimica Sinica, 79(4), p. 369. https://doi.org/10.6023/a20110540

Maguire, G. (2023). *China widens renewable energy supply lead with wind power push.* https://www.reuters.com/markets/commodities/china-widens-renewable-energy-supply-lead-with-wind-power-push-2023-03-01/

Ministério de Minas e Energia, Secretaria de Planejamento e Desenvolvimento Energético. (2022). *2031 Ten-Year Energy Expansion Plan.* https://www.gov.br/mme/pt-br/assuntos/secretarias/sntep/publicacoes/plano-decenal-de-expansao-de-energia/pde-2031/english-version/relatorio_pde2031_introducao_eus.pdf

Ministry of Commerce of the People's Republic of China [中华人民共和国商务部]. (2012, June 25). 中华人民共和国政府和巴西联邦共和国政府十年合作规划 [*The Government of the People's Republic of China and the Government of the Federative Republic of Brazil Ten-Year Cooperation Plan].* http://mds.mofcom.gov.cn/article/ghlt/201206/20120608194994.shtml

Ministry of Commerce People's Republic of China. (2005). *Renewable Energy Law of the People's Republic of China.* http://english.mofcom.gov.cn/article/policyrelease/Businessregulations/201312/20131200432160.shtml

Ministry of Foreign Affairs of the People's Republic of China. (2001). *Speech by Foreign Minister Tang Jiaxuan of the People's Republic of China at the First Meeting of the East Asia-Latin America Forum.* https://www.fmprc.gov.cn/eng/gjhdq_665435/3447_665449/3478_665028/3479_665030/200104/t20010409_595140.html

Myslikova, Z., & Dolton-Thornton, N. (2023). *'Global China' is a big part of Latin America's renewable energy boom, but homegrown industries and 'frugal innovation' are key.* https://fortune.com/2023/07/08/china-secretly-fueling-latin-america-renewable-energy-boom-chile/

Nascimento, A. M., Liu, L., Alves, J. R. C. S., & Oriá, P. (2021). *Chinese investment in the Northeast region of Brazil: An analysis about the renewable energy sector.* https://www.emerald.com/insight/content/doi/10.1108/REGE-12-2020-0147/full/html

Nash, Paul. (2012). *China's "Going Out" Strategy.* Retrieved in July 2024, from: https://www.diplomaticourier.com/posts/china-s-going-out-strategy

OECD Nuclear Energy Agency. (2023). *NEA Annual Report 2022.* https://www.oecd-nea.org/upload/docs/application/pdf/2023-12/nea_ar_2022.pdf

Oxford Business Group. (2023). *América Latina sigue siendo un área clave de la Iniciativa del Cinturón y Ruta de la Seda de China.* https://oxfordbusinessgroup.com/articles-interviews/latin-america-remains-a-key-focus-of-chinas-belt-and-road-initiative/#Espa%C3%B1ol

Peng, Z., Ding, H., Chen, R., Gao, C., & Wang, C. (2019). *Research progress in covalent organic frameworks for energy storage and conversion.* Acta Chimica Sinica, 77(8), p. 681. https://doi.org/10.6023/a19040118

Pettus, Maj Gen Evan. (2023). *The Expanding Leverage of the People's Republic of China in Latin America: Implications for US National Security and Global Order.* https://www.airuniversity.af.edu/JIPA/Display/Article/3276716/the-expanding-leverage-of-the-peoples-republic-of-china-in-latin-america-implica/

Policy Asia-Pacific Energy. (2024). *Guidelines of the Eleventh Five-Year Plan for National Economic and Social Development.* https://policy.asiapacificenergy.org/sites/default/files/11th%20Five-Year%20Plan%20%282006-2010%29%20for%20National%20Economic%20and%20Social%20Development%20%28EN%29.pdf

Presidência da República Casa Civil. (1997). *Lei No 9.478, de 6 de agosto de 1997.* https://www.planalto.gov.br/ccivil_03/leis/l9478.htm

Rana, W. (2015). *Theory of Complex Interdependence: A Comparative Analysis of Realist and Neoliberal Thoughts.* https://ijbssnet.com/journals/Vol_6_No_2_February_2015/33.pdf

Reportlinker.com. (2023). *Wind Farm Market Overview in Brazil 2023-2027.* https://www.reportlinker.com/market-report/Wind-Power/6624/Wind-Farm?term=wind%20farm%20data&matchtype=b&loc_interest=&loc_physical=9062308&utm_group=standard

Shi, Z., Cai, C., Ding, S. W., Wang, T., & Chow, T. L. (2004). *Soil conservation planning at the small watershed level using RUSLE with GIS: a case study in the Three Gorge Area of China.* Catena, 55(1), pp. 33-48. https://doi.org/10.1016/s0341-8162(03)00088-2

State Grid Brazil Holding.br. (n.d.). *Conheça nossa boa energia.* https://stategrid.com.br/#

Tomasetti, B. (2024). *Economic Interdependence.* https://www.carboncollective.co/sustainable-investing/economic-interdependence

TrendEconomy. (2024). *Brazil trade balance, exports, imports by country and region* 2023. https://trendeconomy.com/data/h2/Brazil/TOTAL

Vardiero, P., Lima, A., & Hidd, G. (2020). *Wind energy in brazil: present trends and future scenarios.* International Journal of Advanced Engineering Research and Science, 7(10), pp.16-28. https://doi.org/10.22161/ijaers.710.3

Villamil, J. (2020). *El gigante energético chino hace una incursión en las energías renovables mexicanas con Zuma.* https://www.bloomberg.com/news/articles/2020-11-19/china-power-giant-makes-foray-into-mexican-renewables-with-zuma

Wang, H. (2016). *A deeper look at China's "Going Out" policy.* https://www.cigionline.org/static/documents/hongying_wang_mar2016_web.pdf

Wang, Q., Wang, H., & Yu, H. (2023). *Demarcation of national park boundary based on ecological security pattern: a case study of Yarlung Zangbo Grand Canyon National Park.* 自然资源学报,38(4), p. 951. https://doi.org/10.31497/zrzyxb.20230408

Webster, J., & Tobin, W. (2024). *Beijing's influence on Latin America's energy mix is growing—especially in renewables.* https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/beijings-influence-on-latin-americas-energy-mix-is-growing-especially-in-renewables/

Wind Energy, The Facts. (2009). *Latin America, Brazil.* https://www.wind-energy-the-facts.org/brazil.html

WTO (2024). *China and the WTO*. https://www.wto.org/english/thewto_e/countries_e/china_e.htm

Xie, K., Jiang, M., Chen, X., Lü, Q., & Yu, B. (2021). *Application of α-keto acids in metal-free photocatalysis.* Chinese Journal of Organic Chemistry, 41(12), p. 4575. https://doi.org/10.6023/cjoc202109008

Zhao, Y., Wu, B., & Zeng, Y. (2013). *Spatial and temporal patterns of greenhouse gas emissions from Three Gorges Reservoir of China.* Biogeosciences, 10(2), pp. 1219-1230. https://doi.org/10.5194/bg-10-1219-2013

Belt and Road Energy Cooperation Network [一带一路能源合作网]. (2019, December 6). 巴西能源发展规划 *Brazil energy development planning.* http://obor.nea.gov.cn/v_country/getDataCountry.html?id=1386&channelId=31&status=2

巴西《经济价值报》. (2021 September 19). "一带一路"的机遇 [*Opportunities of the Belt and Road]* 巴西-中国：前途无量的合作"专刊之五 . 中华人民共和国驻巴西联邦共和国大使馆 Embaixada da República Popular da China. http://br.china-embassy.gov.cn/sgxx/sghd/202109/t20210919_9592926.htm

罗婧婧. (2023, June 5). 综述：中国和巴西清洁能源合作再创佳绩 [*China and Brazil's clean energy cooperation achieves new successes].* 新华社 Xinhua News Agency. https://www.yidaiyilu.gov.cn/p/00HUTI6R.html